Subcutaneous emphysema during root canal therapy: endodontic accident by sodium hypoclorite

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Summary

Introduction. **Cervicofacial subcutaneous emphysema is defined as the abnormal introduction of air in the subcutaneous tissues of the head and neck. It is mainly caused by trauma, head and neck surgery, general anesthesia, and coughing or habitual performance of Valsalva manoeuvre. The occurrence of subcutaneous emphysema after dental treatment is rare, and diffusion of gas into the mediastinum is much rarer, especially when the procedure is a nonsurgical treatment.**
Presented here is a case of subcutaneous emphysema that occurred after sodium hypochlorite irrigation during endodontic treatment, and the description of its etiologies and prevention during nonsurgical endodontic treatment.
Endodontic success can be essentially achieved via good debridement of a root canal, and an ideal endodontic irrigant is effective in removing the smear layer, opening the dentinal tubules, and producing a clean surface for closer obturation.
Case report. **A 60-years-old woman had an abnormal swelling and pain during an endodontic treatment accompanied by her dentist to the emergency room and was referred to our observation for complaining of severe pain, ecchymosis and severe swelling on the left side of her face. The aforementioned symptoms appeared after sodium hypochlorite irrigation and aggressive use of air spray for drying the root canal during the endodontic treatment of the upper left lateral incisor.**
Discussion. **An extrusion during an inappropriate endodontic treatment may occasionally be reported and can cause tissue damage. NaOCl is one of the best and most commonly used irrigating solutions because of its efficacy, but it can also negatively affect the periapical tissues.**
Conclusion. **Determining the correct working length, even when performing an intraoperative periapical radiograph and confirming the root canal integrity, could help avoid these kinds of accidents.**

Key words: subcutaneous emphysema, root canal therapy, sodium hypochlorite.

Introduction

Debridement of the root canal system is essential for endodontic success, and it is composed of mechanical instrumentation and the use of antimicrobial irrigating solutions. Root canal irrigants are ideally used for flushing out debris, dissolving organic tissue, killing microbes, destroying microbial products and removing the smear layer. These objectives can be achieved with irrigating solutions reaching the working length of the canal without extruding the periapical tissues (1-3). Sodium hypochlorite solution (NaOCl) is the most commonly used irrigating solution for its strong antimicrobial and proteolytic activity. NaOCl in concentrations ranging from 0.5 to 5.25% is commonly used for irrigating root canals. A better bactericidal activity can be reached by increasing the concentration of NaOCl, but its damaging activities can also be intensified. In fact, NaOCl at high concentrations can cause damage to vital tissues, such as haemolysis, ulceration, inhibition of neutrophil migration, damage to endothelial and fibroblast cells, facial nerve weakness and necrosis after extrusion during inappropriate endodontic treatment (4, 5) These toxic effects can occur because of the solution alkalinity (pH 10.8-12.9) and hypertonicity, which can oxidate proteins and lipid membranes (6). When some of these effects occur, subcutaneous emphysema can appear. Subcutaneous emphysema is obtained when gas or air is in the layer beneath the skin. Since the air is generally emitted from the chest cavity, subcutaneous emphysema usually occurs on the chest, neck and face. It has a characteristic crackling feel to the touch, also known as subcutaneous crepitation. These situations can occur after an infection, trauma

or a surgical procedure. In the odontostomatological environment, emphysema can arise after the irrigating solution's extrusion during inappropriate endodontic treatment and even after repair of facial fractures, periodontal surgery, temporomandibular joint surgery and the extraction of teeth such as a mandibular third molar (7). Anaphylactic reactions to local anaesthesia, haematoma and infection are usually included in the differential diagnosis (8).
The paper investigates tissue damage after NaOCl solution extrusion during root canal treatment and examines how to treat these kinds of accidents.

Case report

A 60-years-old woman had an abnormal swelling and pain during an endodontic treatment accompanied by her dentist to the emergency room and was referred to our observation for complaining of severe pain, ecchymosis and severe swelling on the left side of her face (Fig. 1). The aforementioned symptoms appeared after sodium hypochlorite irrigation and aggressive use of air spray for drying the root canal during the endodontic treatment of the upper left lateral incisor.
The woman's medical history was performed. She reported several episodes of hypersensitivity to different drugs, asthma and previous thyroid cancer. First, an allergic episode was excluded. The extraoral examination revealed that the patient had difficulty opening the left eye, with swelling and an ecchymosis affecting even the upper labial region, the mandibular region and the contralateral infraorbital region. There was also evidence of an issue on the left cheek. Paresthesia of the dental nerves was not diagnosed, but the patient was referred upon altered sensation of the left upper lip region.
Intraoral examination revealed that the affected tooth had its own crown destroyed by decay processes. The part was slightly sensitive to vertical and horizontal percussion and palpation with a mobility of grade 2 was reported (Fig. 2).
There was evidence of periapical swelling. A CT of the head and the maxillary district was prescribed (Figg. 3-5).
The whole condition was diagnosed as air emphysema resulting from sodium hypochlorite solution extravasation during the endodontic treatment. Antibiotic and antiseptic therapy (ceftriaxone) and analgesic and antiedema therapy (betamethasone) were prescribed. Symptoms and the overall conditions of the patient improved three days afterwards (Fig. 6).
A panoramic radiograph was then prescribed. After one month, extraction of the upper left lateral incisor was done, the ecchymosis and the swelling appeared to be fully resolved and the patient's eye opening had returned back to normal (Fig. 7).

Figure 1. Woman with ecchymosis and severe swelling on the left side of the face immediately after the endodontic accident.

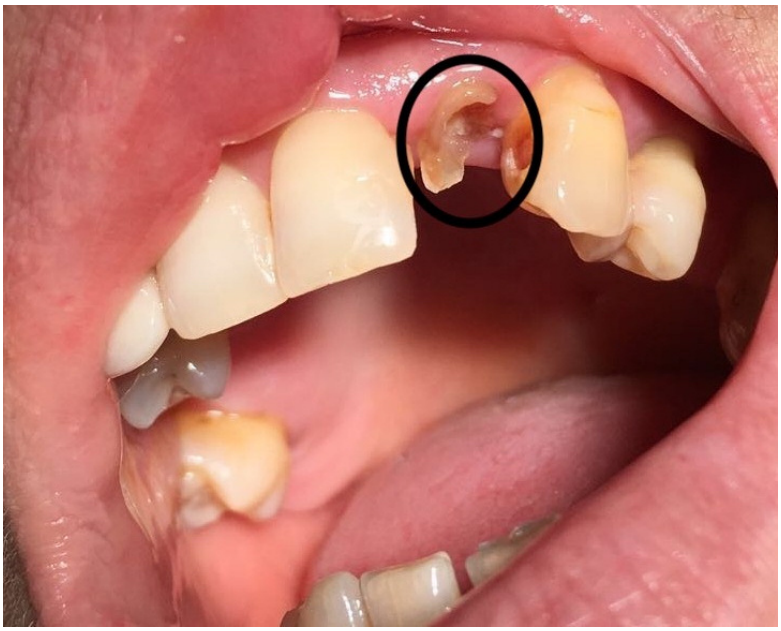

Figure 2. The intraoral situation.

Figures 3-5. CT of the maxillary district (black and white).